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(54) An active element for the support of at least one milling tool, suited to be applied on milling drums of operating machines for the removal of soils

(57) An active element (1; 40, 70; 250, 270) for the support of at least one milling tool (7; 80) of an operating machine for the removal of soils which comprises:

- a supporting element (4; 401, 701) secured to said milling drum (3; 300); - at least one tool-holder (5; 50) secured to said supporting element (4; 401, 701) and provided with at least one recess (8) suited to lodge said at least one milling tool (7; 80); said milling tool presents a tubular-shaped body which is removably inserted into a hole (6; 105) drilled in said supporting element (4; 401, 701), connecting means (9; 403, 703; 13, 72, 53) suited to secure said supporting element (4; 401, 701) to said drum (3; 300) and said at least one milling tool (7; 80) in the corresponding recess (8) of said at least one tool-holder (5; 50).

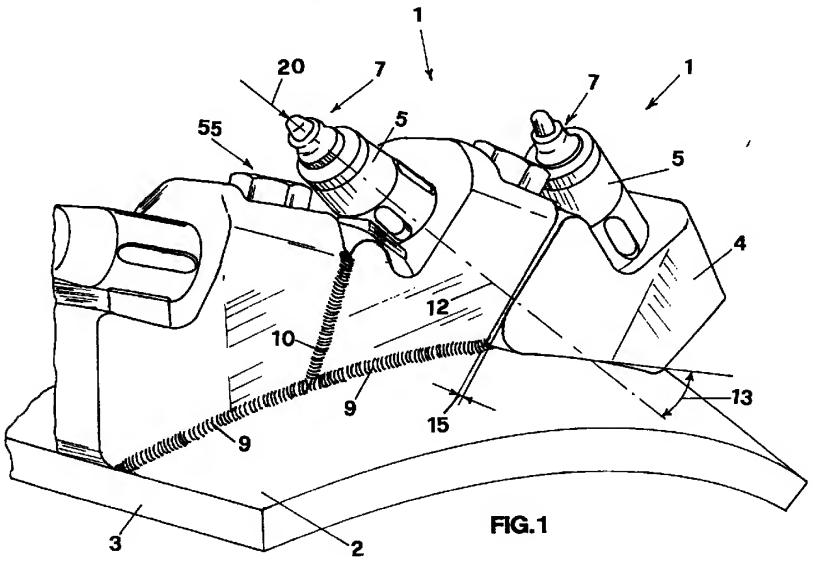

FIG.1

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Description

The invention concerns an active element for the support of at least one milling tool, suited to be applied on milling drums of operating machines for the removal of soils and in particular for the removal of road surfacings.

It is a known fact that for the processing and the removal of soils, operating machines are used. These are equipped with a milling drum presenting a plurality of protruding active elements, each of them equipped with at least one milling tool, which during the rotation of the milling drum crush the road surfacing or at least the soil with which they come into contact.

In the embodiments belonging to the known technique, each active element consists of a prismatic element which is welded to the milling drum and of a tool-holder provided with a hole suited to lodge the milling tool, wherein said tool-holder and said prismatic element are removably connected with one another by means of sliding profiles joined together and are mutually secured by means of screws.

Such known manufacturing shapes of the active elements, present some inconveniences.

A first inconvenience is that the realization cost of said sliding joined together profiles is rather high, since it also involves operations performed with machine tools in addition to the construction of possible molds for the casting and molding operations.

Another inconvenience is that during the use of the milling drum slacks may form in correspondence with such sliding profiles joined together, which, in the long run, can cause the breaking of the supporting element or of the active element in the joining area.

Another inconvenience is that, in order to obtain the prismatic profiles of connection between the elements having surfaces useful to resist to stresses, it is necessary to increase the dimensions of the active element on the whole, thus putting at a serious disavantage the free space between the active elements in the working area, which is needed to help the discharge of the material which is removed.

A further inconvenience is that, in order to secure the tool-holder to the supporting prismatic element, it is necessary, as has been said, to use bolts which are in the immediate contact with the soil which is removed. This causes for the bolts to be subject to a high wear and sometimes also to breaking, with a consequent loss of the tool-holder and of the milling tool during the working process. Such a wear, even when it does not cause the breaking of the bolts, produces their damage at least, thus sometimes making it impossible to remove them whenever it is necessary to take apart the parts forming the active elements.

Not the least inconvenience is that the active elements are all independent from each other, since their respective prismatic elements are secured to the milling drum supporting them one independent from the other and this fact reduces the resistance of each of them to the stresses which develop during their use.

In order to overcome such an inconvenience, in some realizations the prismatic elements of the active elements are connected with one another by means of welded plates but this makes the maintenance activity more complicated, since, in order to take apart one active element, it is necessary to work with the manual grinding wheel to remove the weldings which connect said plates.

The present invention proposes to overcome all the mentioned inconveniences.

In particular, one of the purposes of the invention is to realize an active element for the support of at least one milling tool, suited to be applied to the milling drums of operating machines which, as compared with the active elements belonging to the known technique, involves lower manufacturing costs.

Another purpose is for the active element according to the invention to be less subject to the occurrence of slacks between the junctions during its use.

Another purpose is for the active element according to the invention to present a better mechanical resistance, as compared with active elements belonging to the known technique of equal dimensions.

A further purpose is for the active element according to the invention to present, as compared with active elements belonging to the known technique, a better resistance against the breaking of the securing means which connect the tool-holder with the supporting element welded to the milling drum.

Another purpose is for the active element according to the invention to permit, as compared with active elements belonging to the known technique, a faster replacement of both the tool-holder and the milling tool.

Not the least purpose is for the active element to be equipped with means suitable for preventing the loss of the tool-holder and of the milling tool, should the means securing said tool-holder to the supporting element break during the use.

The described purposes are achieved by an active element for the support of at least one milling tool, said element being part of a plurality of elements belonging to the milling drums of operating machines for the removal of soils which, in accordance with the main claim, comprises:

- a supporting element secured to said milling drum;
- at least one tool-holder secured to said supporting element and provided with at least one recess suited to lodge said at least one milling tool and is characterized in that said at least one tool-holder presents a tubular-shaped body which is removably inserted into a hole drilled in said supporting element, connecting means being present suited to secure said supporting element to said drum and said at least one milling tool in the corresponding recess of said at least one tool-holder.

According to one preferred embodiment, said sup-

porting element consists of a single block made of steel which is welded to said drum and which presents a hole having a circular section suited to lodge the tubular body having a circular section of said tool-holder.

The tubular body of said tool-holder presents a taper in the shape of a truncated-cone in correspondence with the part which matches the corresponding hole drilled in said supporting element and said hole presents a profile in the shape of a truncated-cone which can be coupled with said taper of said tool-holder.

Said milling tool is co-axially coupled in the tubular body of said tool-holder, in which there are also a plurality of through-going radial slits suited to lodge an axially forcing wedge for the removal of said tool.

The body of the tool-holder is also provided with a surface plane against which locking means co-operate.

According to a different embodiment, the supporting element is formed by a first body which is secured by welding to said drum and by a second body which is lodged into a seat obtained in said first body and which presents a hole suited to receive the tool-holder with its respective tool.

Said second embodiment of said supporting element makes easier to put together right-hand and left-hand active elements suited to realize on the rotating drum right-hand and left-hand helixes, respectively.

Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific example, while indicating a preferred embodiment of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description and from the drawings, wherein:

- Fig. 1 shows the detail of three active elements according to the invention applied to the surface of a milling drum;
- Fig. 2 shows the three supporting elements and their corresponding adjusting elements belonging to the three active elements represented in Fig. 1;
- Fig. 3 shows two active elements according to the invention represented in a longitudinal section;
- Fig. 4 shows in an exploded view the tool-holder and the milling tool belonging to the active element forming the object of the invention;
- Fig. 5 shows the tool-holder and the tool of Fig. 4 represented in an assembled view;
- Fig. 6 shows the tool-holder and the milling tool belonging to the active element according to the invention, during the removal phase of the milling tool from the tool-holder within which it is mounted;
- Fig. 7 shows a different embodiment of the adjusting elements belonging to the active elements according to the invention;
- Fig. 8 represents in a front view a plurality of active elements according to the invention secured to the milling drum and realized according to a different embodiment;
- Fig. 9 represents the detail of the right-hand extremity of the milling drum of Fig. 8;
- Figs. 10 and 11 represent two views of an active element according to the invention realized according to said different embodiment and belonging to a right-hand helix of the drum represented in the Figs. 8 and 9;
- Fig. 12 represents the detail of the left-hand extremity of the milling drum of Fig. 8;
- Figs. 13 and 14 represent two views of an active element according to the invention realized according to said different embodiment and belonging to a left-hand helix of the drum represented in the Figs. 8 and 9;
- Figs. 15, 16, 17 and 18 represent the lateral and plan views, respectively, of one of the parts forming an active element realized according to the different embodiment of the invention;
- Figs. 19, 20, 21 and 22 represent different views of another one of the parts forming the active element according to the invention realized according to said different embodiment.

As can be observed in Fig. 1, the active element according to the invention, indicated as a whole with 1, is represented together with two other active elements similar to it, all of which are secured to the surface 2 of a milling drum 3 represented in a partial view.

By observing also Fig. 2 and Fig. 3, it can be noticed that said active element 1 comprises:

- a supporting element 4 which is secured to the surface 2 of the milling drum 3;
- a tool-holder 5 which is lodged in a hole 6 drilled in said supporting element 4;
- a milling tool 7 which, as can be observed in Fig. 4, is lodged in a recess 8 consisting of a through-going axial hole drilled in the body of said tool-holder 5.

Each of said supporting elements 4 is secured to the surface 2 of the rotating drum 3 through connecting means which consist of a weld bead 9 and all of said supporting elements 4 are also secured together through other weld beads 10.

It can also be observed that each supporting element 4 is axially removed on drum 3 by a distance 15 in relation to the supporting element adjacent to it, as can be observed in Fig. 1 wherein, in order to point out what has been said, one of the active elements is represented without the welding connecting it to the drum and to its adjacent element. All the active elements then, essentially form a helix which wraps around drum 3 as a single body, thus increasing the overall mechanical resistance of the drum and of the active elements.

In each of said supporting elements 4, which are preferably obtained with forging or cutting operations

from a thick plate, said hole 6 is in the shape of a truncated-cone suited to lodge part 51 of said tool-holder 5 which, as can be observed in Fig. 4, consists of a tubular body presenting a taper 52 equal to the taper, not represented, with which said hole 6 is made. In such a way, the coupling between the tool-holder 5 and the supporting element 4 occurs by the interference of the taper which ensures a good stability of the connection and the absence of slacks.

It has been said, as can be observed in Fig. 4, that said tool-holder 5 presents a tubular body and is provided with a recess consisting of a through-going axial hole 8 which is suited to lodge the milling tool 7, the body of which, as can also be observed in Fig. 4, presents a cylindrical area 71 comprised between a pair of annular areas 72 and 73 having larger diameters as compared with said cylindrical area 71, the latter being suited to receive the coupling of an elastic sleeve 13 which presents, when viewed in a cross-section, essentially a C-shape.

In the opposite part of said cylindrical area 71, the milling tool 7 is provided with an insert 90 made of a hard material, preferably tungsten carbide.

The inner hole 65 of the elastic sleeve 13 presents a slightly smaller diameter as compared with the cylindrical area 72 of the milling tool 7, so that sleeve 13, in order to be coupled with the cylindrical area 71, must be axially forced beyond the annular area 72 and, once the coupling has been done, the elastic sleeve 13 remains stably comprised between the annular areas 72 and 73 and co-axial with the cylindrical area 71, on which it is loosely fitted. The milling tool 7 is then axially fitted within recess 8 of the tool-holder 5 by forcing the elastic sleeve 13 which presents a slightly larger outside diameter than the inside diameter of recess 8 and, after the coupling, the contrast of the elastic sleeve 13 against the annular area 53 of the tool-holder 5, ensures the stability of the connection between the milling tool 7 and the tool-holder 5.

The milling tool 7, therefore, results to be constrained within the tool-holder 5, from which it cannot be axially separated butwithin which it can rotate freely around axis 12 following either sense of direction 11.

It is easy to understand that the co-axiality between the milling tool 7 and the tool-holder 5 and of the latter within hole 6 drilled in the supporting element 4, reduces to a minimum the bending moment which the milling tool 7 during the work discharges on welding 9 securing each supporting element 4 to the surface 2 of the drum and it also reduces essentially to zero_the bending moment which the milling tool 7 discharges on the tool-holder 5 and, therefore, on the junction area between the tool-holder and the supporting element 4, contrary to what happens in the embodiments belonging to the known technique.

In Fig. 1 it can also be observed that the alignment axis 12 of the milling tool 7 and of the tool-holder 5 is slanted by an angle 13 in relation to surface 2 of the rotating drum 3 and this causes the component 20 of the stress, which is exerted along axis 12 of each milling tool 7 during the working process, to be partly discharged on the supporting element of the adjacent active element, since, as has already been said, all the active elements are mechanically secured together by means of the welding beads 10. This fact allows a better distribution of the stresses on the supporting elements and, therefore, on the milling drum 3, to the great advantage of a higher resistance.

In order to ensure the stability of each tool-holder 5 in relation to the corresponding supporting element 4, connecting means are foreseen, which consist of a surface plane 54 obtained externally to said tool-holder 5, which co-operates by contrast with locking means consisting of at least one bolt 55 which matches a threaded through-going hole 56 drilled in the supporting element 4. The interference of the extremity 57 of said bolt 55 against said surface plane 54, prevents the rotation of the tool-holder 5 in the supporting element 4 within which is coupled and it also prevents it from being axially detached.

As can be observed in the Figs. 2 and 3, each active element is also provided with at least one adjusting element consisting of at least one plate 61 secured through at least one bolt 62 inside a recess 63 obtained in the supporting element 4, said plate making up for possible slacks which might occur in the course of the time between the tool-holder 5 and hole 6 drilled in the supporting element 4 with which the tool-holder 5 is coupled.

A different embodiment of the adjusting element is represented in Fig. 7 wherein it can be observed that said adjusting element consists of a bolt 162 which is tightened in a threaded hole 163 drilled in said supporting element 4 and whose head 161, which is adjustable by means of a control key, inteferes against said tool-holder 5 and recovers possible slacks existing between the tool-holder 5 and hole 6 lodging it.

It can also be observed that said adjusting element is provided with safety means 81 consisting of a hole 84, drilled through co-axially in said bolt 162, within which is inserted a ball 82 made elastic through a spring 83, the thrust of which forces ball 82 inside a recess 85 obtained in the body of the tool-holder 5.

If, during the working process, bolt 55 breaks or becomes loose and is eventually lost, the interference of ball 82 in the recess 85 prevents the tool-holder 5 from separating from the supporting element 4 with which it is coupled.

In order to remove the milling tool 7, a forcing wedge 91, represented in Fig. 6, is used. This is inserted into one of the slits 58 going through the body 51 of the tool-holder 5, so that they communicate with the through-going hole 8 which forms the recess within which the milling tool 7 is lodged. The thrust of the forcing wedge 91 following direction 92, causes an axial thrust following direction 93 on the milling tool 7 which is easily ejected.

Should it not be possible to eject in this way the mill-

ing tool 7, because due to excessive oxidation it has got stuck in the recess 8 within which it is lodged, it is always possible to exert a stronger action by introducing a puller inside the through-going hole 8 itself following direction 94 and directly exert an axial thrust, for instance with a hammer or a mallet. It is easy to understand that in this way, contrary to what happens in the realizations belonging to the known technique, the removal of the milling tool 7 is much easier and faster, even in those cases when the oxidation, due to the long use of the active element, makes it difficult to separate the elements joined together.

In order to facilitate the removal of the soil, the active elements are arranged on the milling drum according to one or more right-hand and left-hand helixes which develop beginning from the centre of the drum itself. Moreover, in order for all of the active elements to be in the same working conditions, independently on whether they belong to the right-hand or the left-hand helix, it is necessary for the longitudinal axis of the tool of each active element to be slanted by the same angle in relation to the axis of the respective helix and, preferably, to be sligthly convergent toward the centre of the drum itself. For that reason, each supporting element presents the hole lodging the tool-holder oriented in a different way, depending on whether the active element, which said supporting element forms, belongs to either a right-hand helix or to a left-hand helix. This fact causes the inconvenience to have to realize right and left supporting elements, not interchangeable with one another.

In order to overcome such inconvenience, a different embodiment of the invention foresees for the active element to be provided with a supporting element which, instead of being realized in one piece, is composed of a right-hand or left-hand body which is secured to the drum so as to define the right-hand and the left-hand helixes, respectively, and of a universal body, which supports the tool-holder with the corresponding tool, which is lodged without distinction in a seat obtained in either said right-hand body or in said left-hand body.

With reference to Fig. 8, it can be observed that the active element of the invention, according to said different embodiment, is realized in the right-hand version, indicated as a whole with 40, and in the left-hand version, indicated as a whole with 70, suited to realize on the milling drum 300 right-hand helixes 400 and left-hand helixes 700, respectively.

Each right-hand active element 40, as can be observed in the Figs. 9, 10 and 11, presents a supporting element 401 formed by a right-hand base 402 which is secured to the milling drum 300 through first securing means consisting of weldings 403 and by a universal body 100, also visible in the Figs. from 19 to 22, in which there is the hole in the shape of a truncated-cone 105 which lodges the tool-holder 50 with the corresponding tool 80 and which, in turn, is lodged in a seat 406 present in said right-hand base 402, visible in better details in Fig. 15.

Similarly, each left-hand active element 70, as can be observed in the Figs. 12, 13 and 14, presents a supporting element 701 formed by a left-hand base 702 which is secured to the milling drum 300 through first securing means consisting of weldings 703 and by the same universal body 100 which is lodged in a seat 706 present in said left-hand base 702 and visible in better detail in Fig. 17.

The right-hand basis 402 and left-hand base 702, as can be observed in particular in the Figs. from 15 to 18, are realized specular in relation to one another, so that when they are arranged according to axis 121 or 131, respectively, of the right or left helix to which they belong, their seats 406 and 706 which lodge the same universal body 100, can orient the universal body 100 itself so that, as can be observed in the Figs. 9 and 13, the axis 251 of the tool-holder 50 and of the corresponding tool 80 are slanted by the same angle 151 in relation to the longitudinal axis 121 and 131 of the helix to which they belong. In this way, all the tools 80, independently from the helix and from the active element to which they belong, turn out to be slanted by the same angle 221 in relation to the longitudinal axis 200 of the milling drum, as can be observed in Fig. 8.

In particular, when the universal body 100 is lodged in the right-hand base 402 to form the right-hand active element 40, it is inserted in seat 406, positioned as represented in the plan view of Fig. 19, while when it is lodged in the left-hand base 702 to form the left-hand active element 70, it is inserted in seat 706, positioned as represented in the plan view of Fig. 21, that is, in the position it acquires when from the position of Fig. 19 it is turned around axis 120 following the anti-clockwise direction 145. It can be observed, in fact, that in both the right-hand active element 40 represented in Fig. 10 and in the left-hand active element 70 represented in Fig. 13, it is the same lateral constrast wall 143 of the same universal body 100 that goes to contrast against the lateral reference wall 423 of seat 406 of the right-hand base 402 or against the lateral reference wall 723 of seat 706 of the left-hand base 702, and this is obtained by turning the universal body 100 around its axis 120.

When the universal body 100 is lodged in the seats 406 or 706 it presents, as can be observed in the Figs. 20 and 22, the bottom contrast surface 144 and 44, respectively, which comes into contact with the bottom reference surface 426 and 726, respectively, of the right-hand base 402 or left-hand base 702.

In each of said bottom contrast surfaces 144 and 44 there is a pair of holes 147 and 47, respectively, each of which lodges a cylindrical pin, not represented, which matches a corresponding hole 427 and 727, respectively, visible in the Figs. 15 and 17, drilled in each right-hand base 402 and left-hand base 702, respectively. The presence of such pins and of such holes permits the centering of the universal body with its corresponding base, before stably and irremovably securing the universal body to the base itself through said second

securing means which consist of the weldings 146 visible in the Figs. 11 and 14.

With the right-hand and left-hand active elements 40 and 70, respectively, thus described, it is possible to obtain, as can be observed in Fig. 8, the right-hand helix 400 and the left-hand helix 700 which are slanted by the same angle 221 in relation to the longitudinal axis 200 of the milling drum 300. Moreover, the longitudinal axis 251 of each tool-holder 50 is slanted by an angle 151 in relation to the corresponding helix and, as can be observed, it turns out to be slightly convergent toward the centre.

The active elements according to the invention realized according to the just now described different embodiment, permit to realize very easily the terminal part of each helix in correspondence with the extremities of drum 300 wherein, as can be observed in Fig. 8, the tools of the active elements 250 and 270 which protrude in relation to the right extremity 350 and left extremity 370 of the drum itself, in order to obtain the finish of the edge 251 and 271, respectively, of the excavation to be performed. In fact, once the right-hand and left-hand bodies have been arranged with inclinations differing from the other elements previously secured to the drum, each active element will be completed by applying the same universal body inserted in its corresponding seat.

As can be observed, all the active elements of the drum will be arranged adjacent to one another and will be mutually welded so as to realize, as can be observed in Fig. 8, a continuous helix with the purpose of obtaining a mechanical resistance which is homogeneously distributed all along the length of the helix itself.

In the Figs. 15 and 17 in particular, it can be observed that each right-hand base 402 and left-hand base 702 defines, with its respective drum, a cavity 600 which is necessary to reduce the total weight of the drum and the perimeter of the element welded to the drum itself, thus obtaining the double advantage of reducing the cost of welding and of limiting the heating of the drum caused by the welding itself, thus limiting possible deformations.

On the basis of what has been said, it is easy to understand that the active element according to the invention, realized according to all the described different embodiments, achieves all the proposed purposes.

During the manufacturing phase, the shapes of the elements which form each active element, may vary in relation to what has been described and respresented in the enclosed drawings.

The means for locking, for adjusting and for the safety, for the coupling between each tool-holder and its corresponding supporting element, may also be manufactured differently.

Also the degree of inclination of the helixes according to which said active elements are arranged on the drum, as well as the degree of inclination of the angle of the tool themselves may vary.

It is to be understood that all the described elements can be realized according to any shape and dimension and that possible variations differing from those mentioned and not described, however, all fall within the spirit and scope of the present invention.

Claims

1. An active element (1; 40, 70; 250, 270) for the support of at least one milling tool (7; 80) and being part of a plurality of elements belonging to the milling drums (3; 300) of operating machines for the removal of soils comprising:

   - a supporting element (4; 401, 701) secured to said milling drum (3; 300);
   - at least one tool-holder (5; 50) secured to said supporting element (4; 401, 701) and provided with at least one recess (8) suited to lodge said at least one milling tool (7; 80), **characterized in that** said at least one tool-holder (5; 50) presents a tubular-shaped body which is removably inserted into a hole (6; 105) drilled in said supporting element (4; 401, 701), connecting means (9; 403, 703; 13, 72, 53) being present suited to secure said supporting element (4; 401, 701) to said drum (3; 300) and said at least one milling tool (7; 80) in the corresponding recess (8) of said at least one tool-holder (5; 50).

2. An active element (1; 40, 70; 250, 270) according to claim 1, **characterized in that** said tubular body of said tool-holder (5; 50) presents an essentially circular transversal section and is provided with a taper in the shape of a truncated-cone (52) in correspondence with the part (51) which matches said hole (6; 105) drilled in said surface element (4; 401, 701), said hole (6; 105) presenting a profile in the shape of a truncated-cone matching said taper (52) of said tool-holder (5; 50).

3. An active element (1; 40, 70; 250, 270) according to claim 1, **characterized in that** said recess obtained in said tool-holder consists of a through-going hole (8) having a circular section, co-axially drilled in the body of said tool-holder (5; 50).

4. An active element (1; 40, 70; 250, 270) according to claim 1, **characterized in that** said tool-holder (5; 50) presents lateral slits (58) communicating with said recess (8), said lateral slits (58) being suited to permit the introduction of a forcing wedge (91) for the removal of said milling tool (7; 80) lodged in said recess (8).

5. An active element (1) according to claim 1, **characterized in that** said connecting means suited to secure said at least one tool-holder (5) to said supporting element (4) consist of at least one surface

plane (54), obtained externally to said tool-holder (5), suited to co-operate by contrast against the extremity (57) of at least one bolt (55) matching a threaded through-going hole (56) drilled in said supporting element (4), whenever said bolt (55) is screwed in said threaded hole (56) lodging it.

6. An active element (1) according to claim 1, **characterized in that** said supporting element (4) is provided with at least one adjusting element (61; 161, 162) suited to co-operate against said tool-holder (5) in order to make up for slacks existing between said tool-holder (5) and said hole (6) drilled in said supporting element (4) within which said tool-holder (5) lodges.

7. An active element (1) according to claim 6, **characterized in that** said at least one adjusting element consists of a plate (61) interposed between said supporting element (4) and said tool-holder (5) and secured inside a recess (63) obtained in the supporting element (4) itself by means of at least one bolt (62).

8. An active element (1) according to claim 6, **characterized in that** said at least one adjusting element consists of the head (161) of a bolt (162) matching a threaded hole (163) drilled in said supporting element (4), said head (161) of said bolt (162) contrasting against said tool-holder (5).

9. An active element (1; 40, 70; 250, 270) according to claim 1, **characterized in that** said connecting means suited to secure said at least one milling tool (7; 80) to said at least one tool-holder (5; 50) comprise at least one elastic sleeve (13) presenting, when viewed in a cross-section, a C-shaped profile which loosely couples within a cylindrical area (71) present in the body of each milling tool (7; 80), which is comprised between a pair of annular areas (72, 73) preventing the axial slippage of said elastic sleeve (13) which is coupled by pressure in said recess (8) of said tool-holder (5; 50), within which it is constrained only in relation to the axial slippage by contrast against an annular area (53) present in the tool-holder (5; 50) itself.

10. An active element (1; 40, 70; 250, 270) according to claim 9, **characterized in that** the body of said milling tool (7; 80) presents, in correspondence with the extremity protruding from said recess, an insert made of hard material (90).

11. An active element (1; 40, 70; 250, 270) according to claim 10, **characterized in that** said hard material (90) is a compound of tungsten carbide.

12. An active element (1; 40, 70; 250, 270) according to claim 1, **characterized in that** said connecting means suited to secure said supporting element (4; 401, 701) to said milling drum (7; 80) consist of at least one weld bead (9; 403, 703) obtained on the perimeter of the face of said supporting element (4; 401, 701) in contact with the surface (2) of said milling drum (3; 300).

13. An active element (1) according to claim 1, **characterized in that** said supporting elements (4) are secured together through weld beads (10) and each of them removed by an amount (15) in relation to its adjacent element, following the axial direction of said milling drum (3) to which they are secured.

14. An active element (1) according to claim 8, **characterized in that** said at least one adjusting element (161, 162) is provided with safety means (81) which comprise a ball (82) made elastic by means of a spring (83), both of them being inserted into a recess (84) obtained in the body of said bolt (162) to which said head (161) belongs, said ball (82) protruding from said head (161) in correspondence with a recess (85) obtained in the area (51) of the tool-holder (5), which couples with said supporting element (4).

15. An active element (1) according to claim 1, **characterized in that** said supporting element (4) is realized in one single body.

16. An active element (40, 70; 250, 270) according to claim 1, **characterized in that** said supporting element (401, 701) is formed by a base (402, 702) and by a universal body (100) which is lodged in a seat (406, 706) obtained in said base (402, 702) and within which there is said hole (105) which lodges said body of said at least one tool-holder (50), said connecting means (404, 703) being suited to secure said base (402, 702) to said milling drum (300).

17. An active element (40, 70; 250, 270) according to claim 16, **characterized in that** said universal body (100) is lodged in said seat (406, 706) within which it is stably fixed by means of at least one junction pin which couples one extremity in at least one hole (147, 47) belonging to said universal body (100) and the opposite extremity in at least one further hole (427, 727) drilled in said base (402, 702).

18. An active element (1; 40, 70; 250, 270) according to claim 1, **characterized in that** said connecting means (9; 403, 703) suited to secure said supporting element (4; 401, 701) to said drum (3; 300) consist of weldings (9; 403, 703).

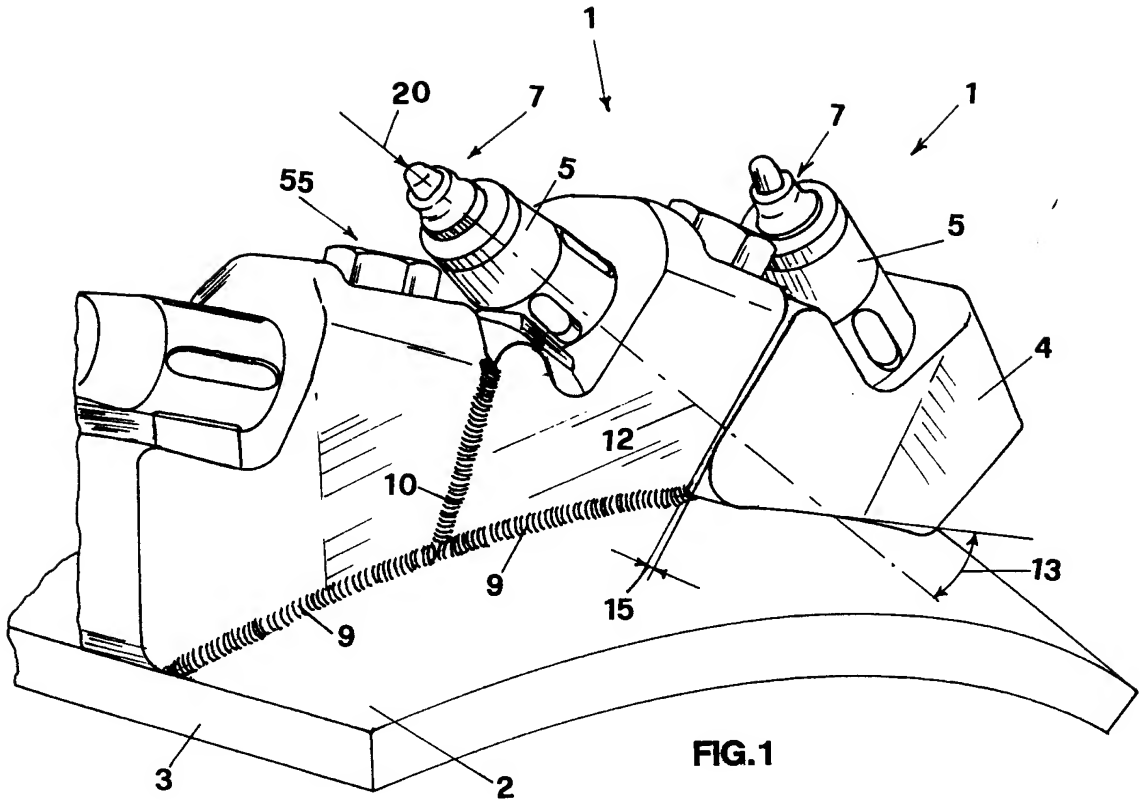

FIG.1

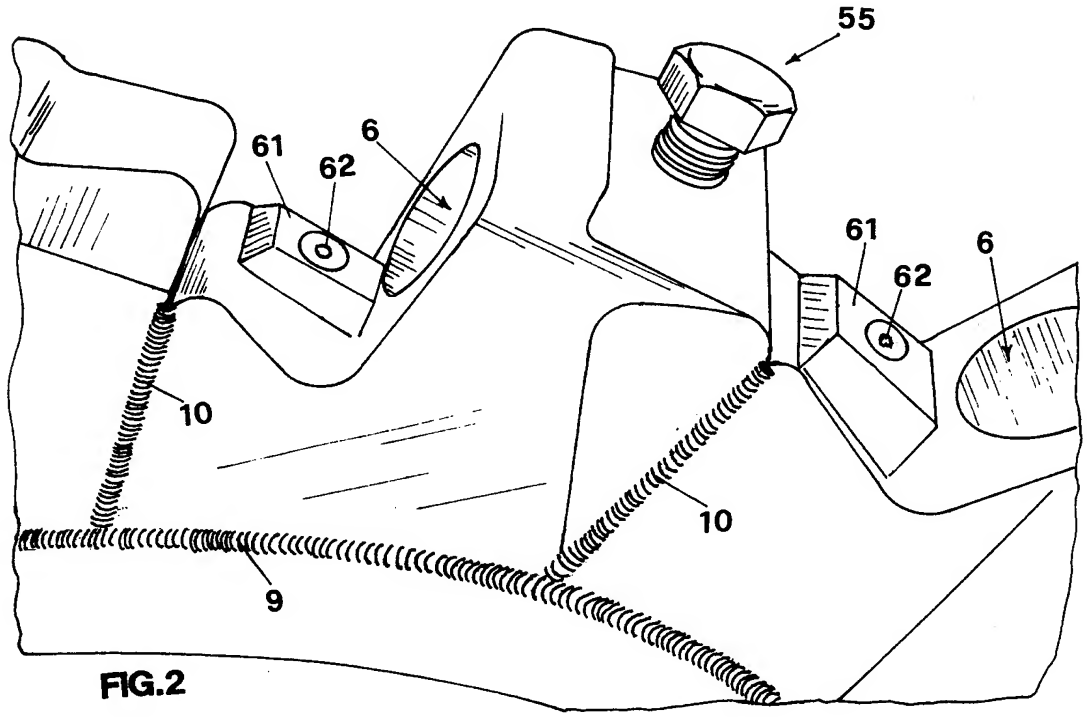

FIG.2

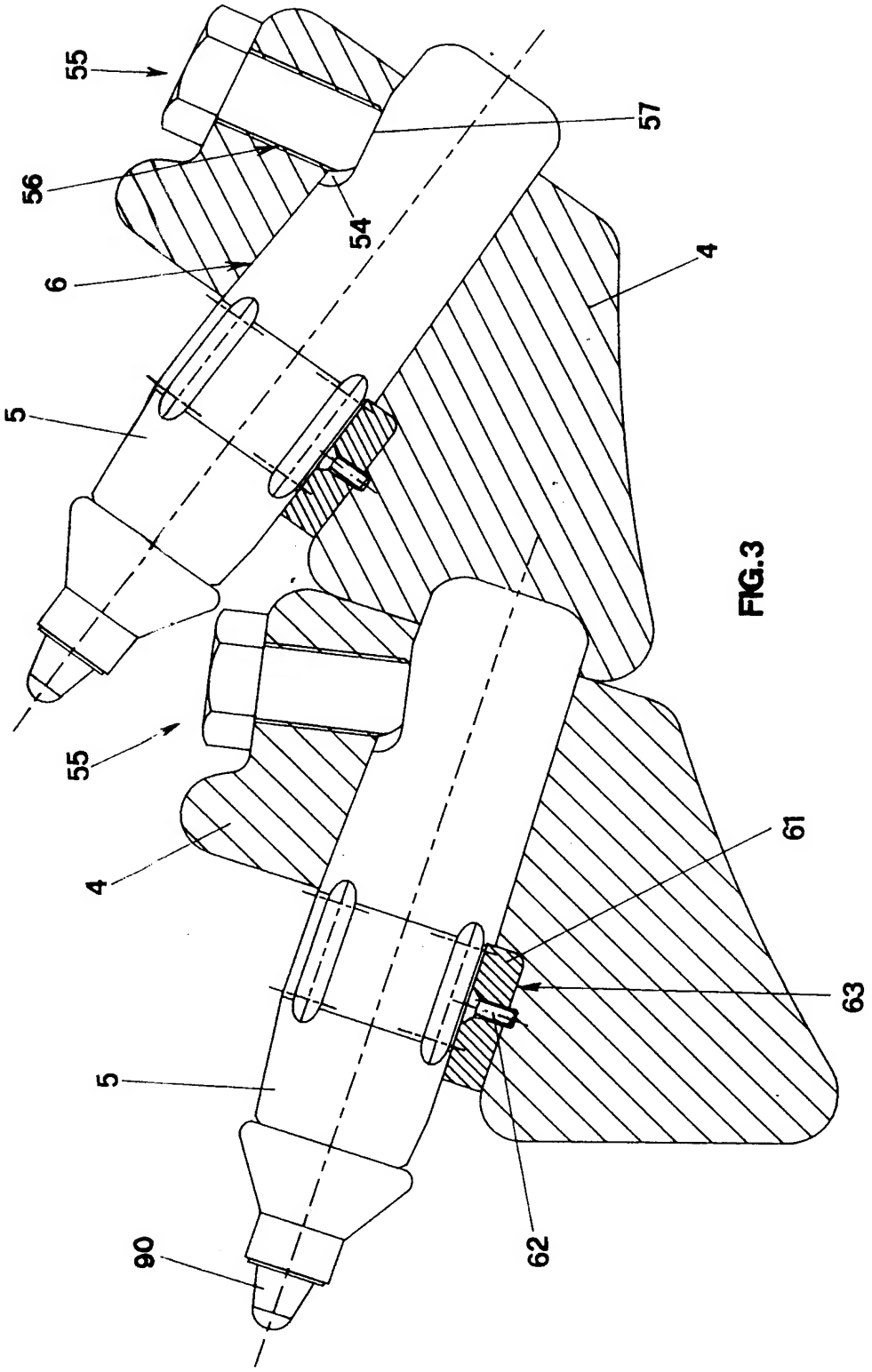

FIG.3

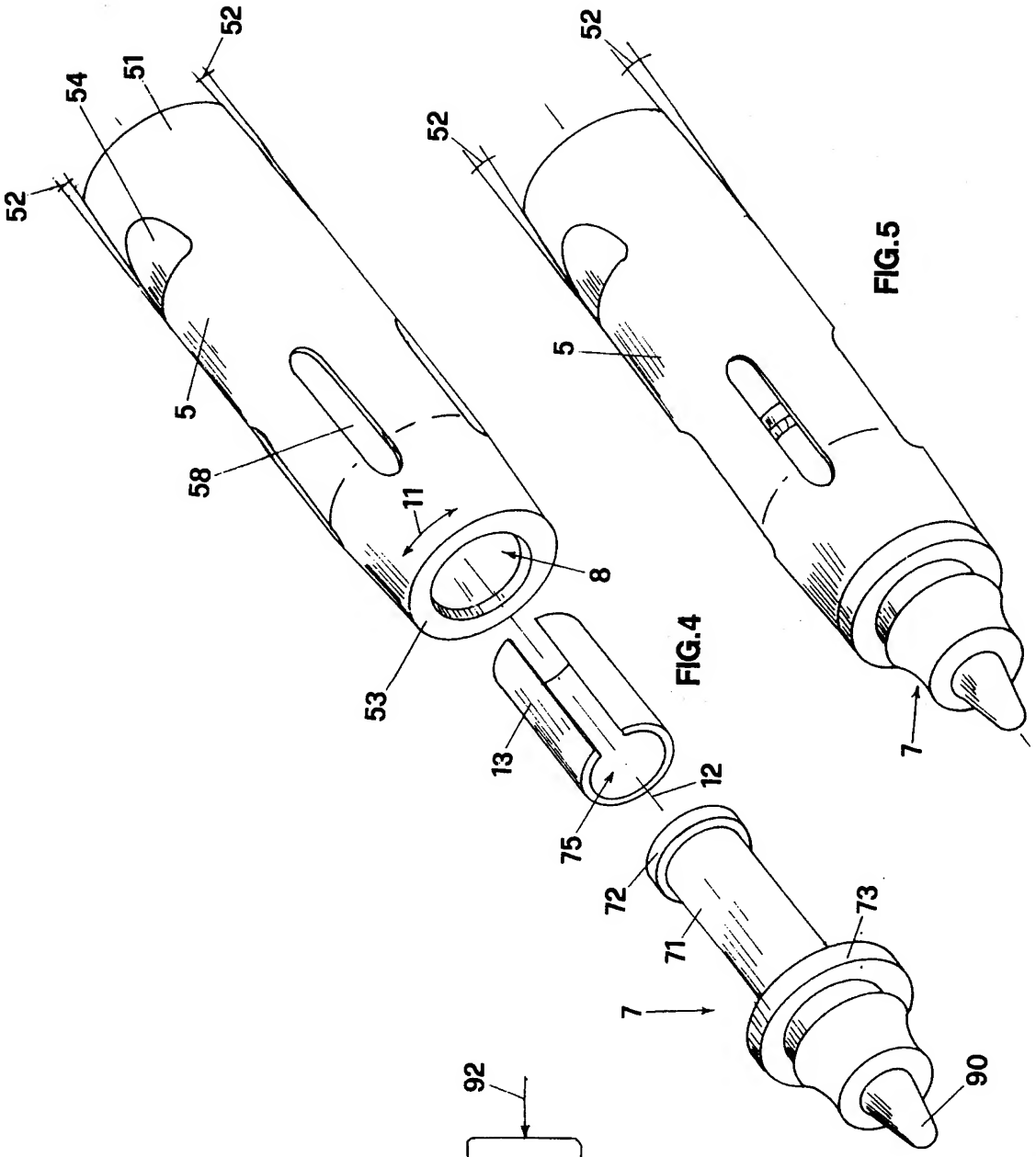

FIG.4

FIG.5

FIG.6

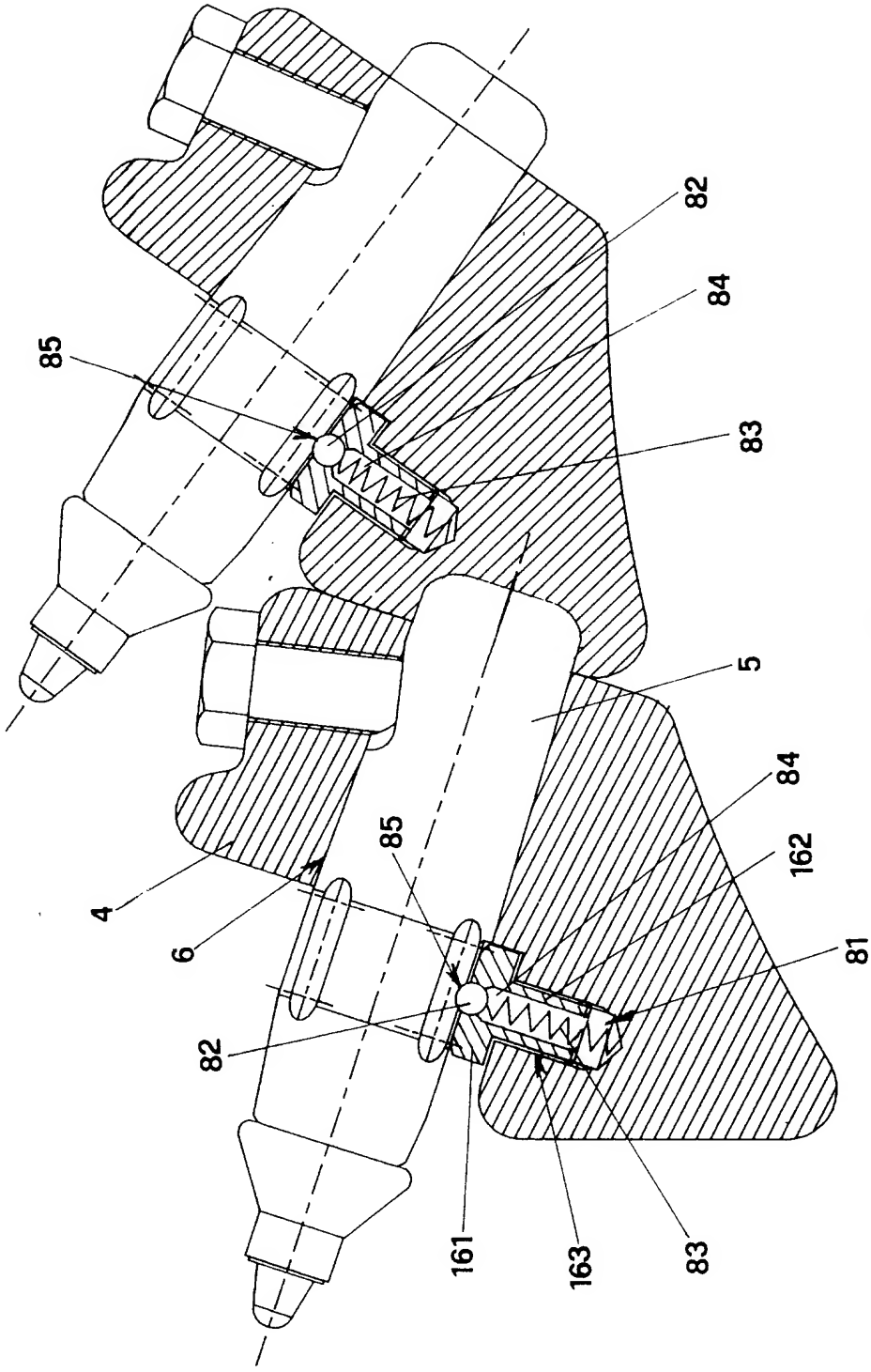

FIG.7

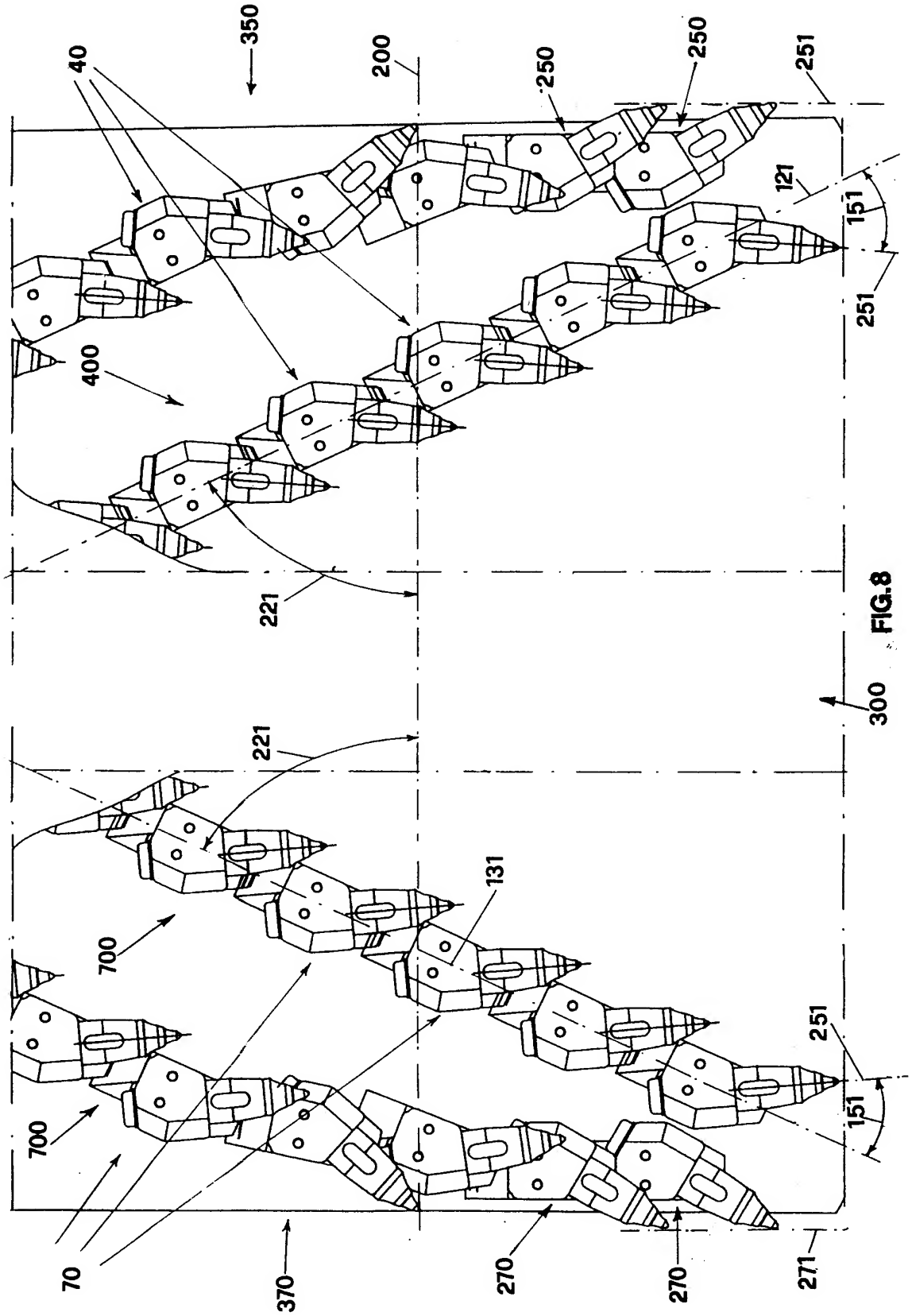
350
40
200
250
250
251
121
151
251
400
221
300
221
131
700
700
251
151
70
370
270
270
271

FIG.8

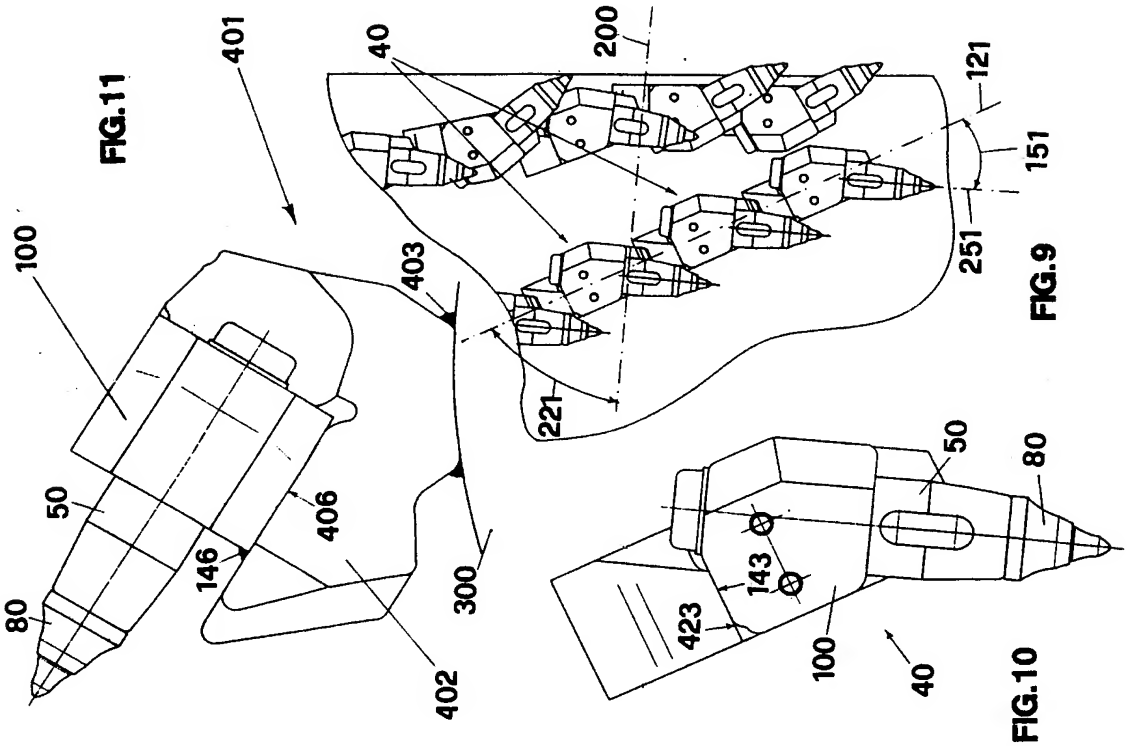
FIG.11
401
40
200
121
151
251
100
403
50
406
146
80
300
402
221
FIG.9
50
80
143
423
100
40
FIG.10

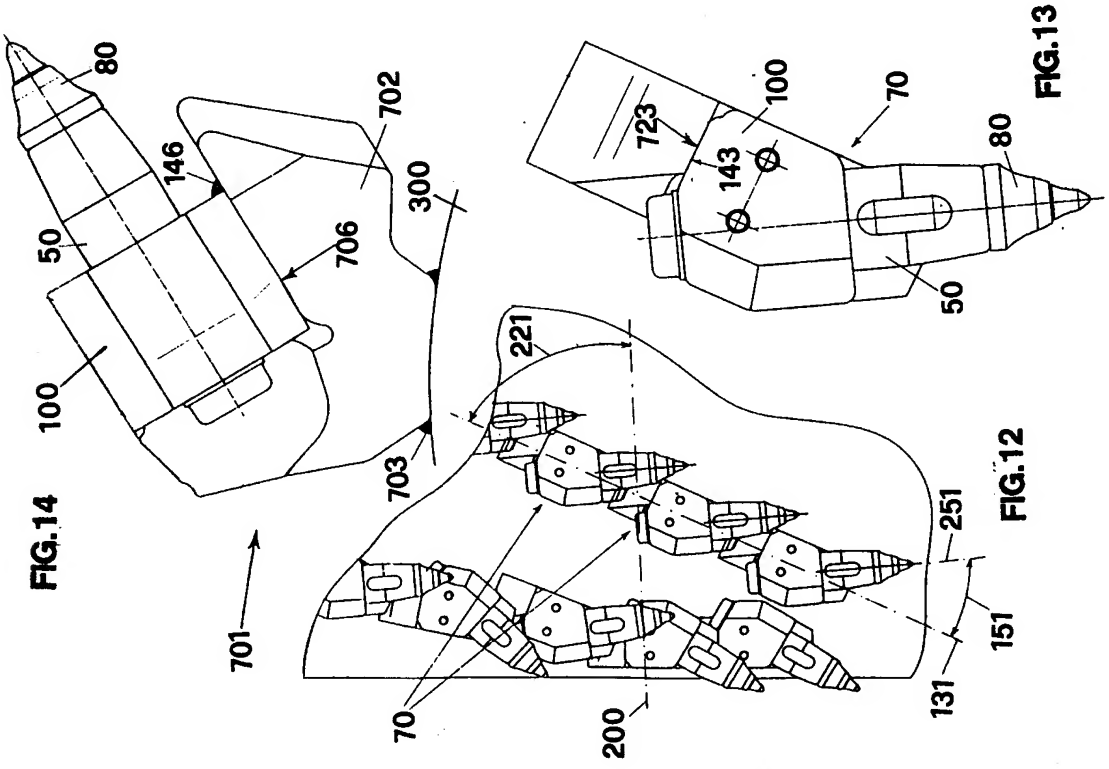
FIG.14
80
146
702
300
50
706
100
703
221
701
70
200
251
151
131
FIG.12
723
100
70
143
80
50
FIG.13

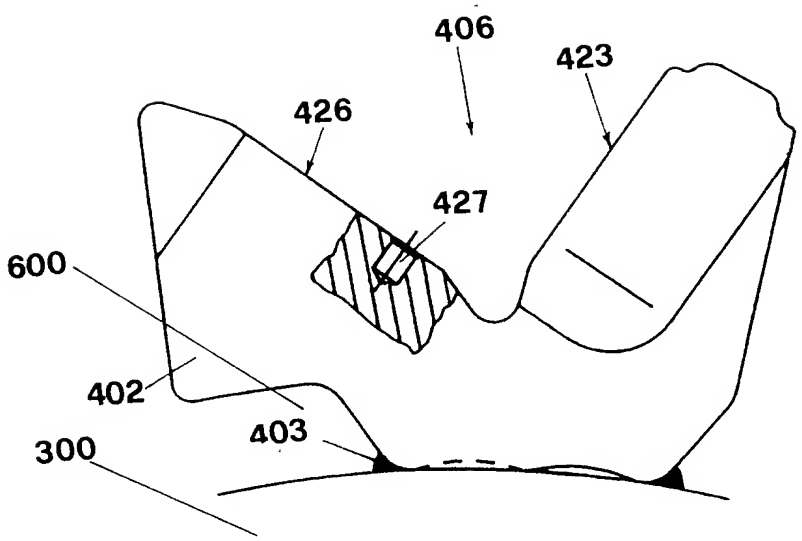

FIG.15

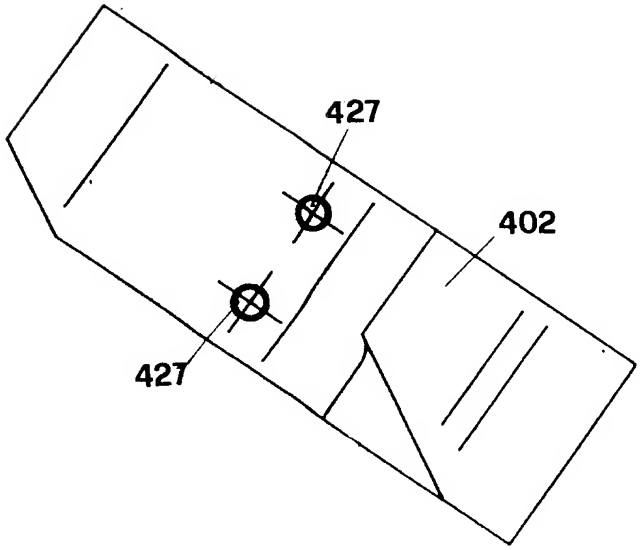

FIG.16

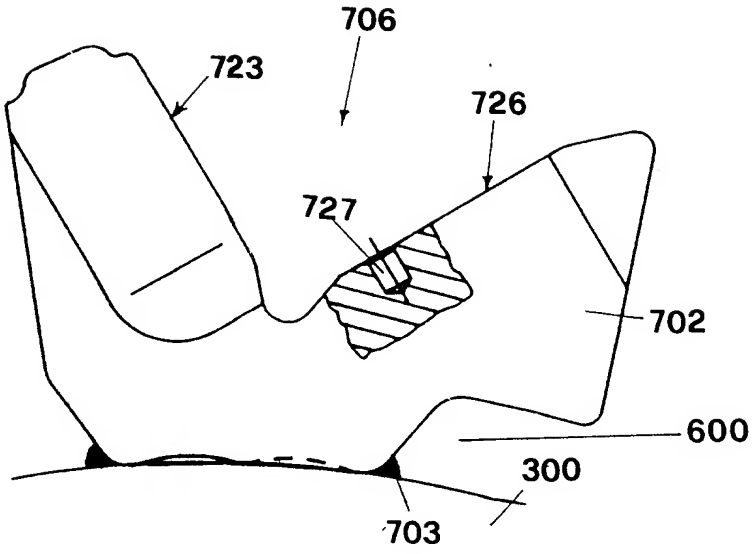

FIG.17

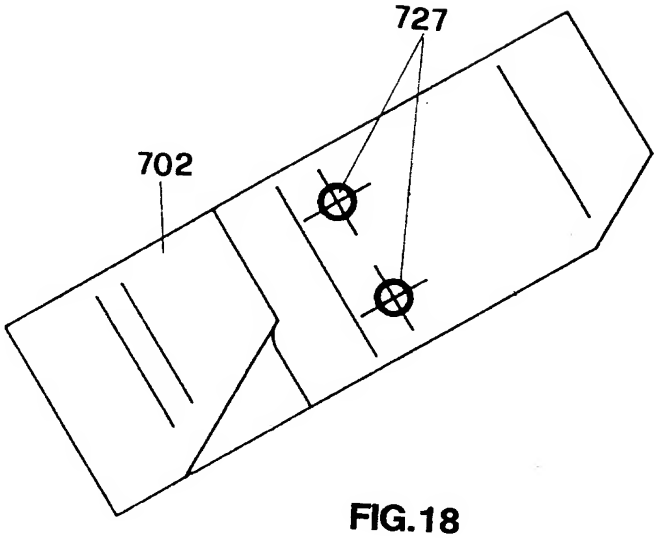

FIG.18

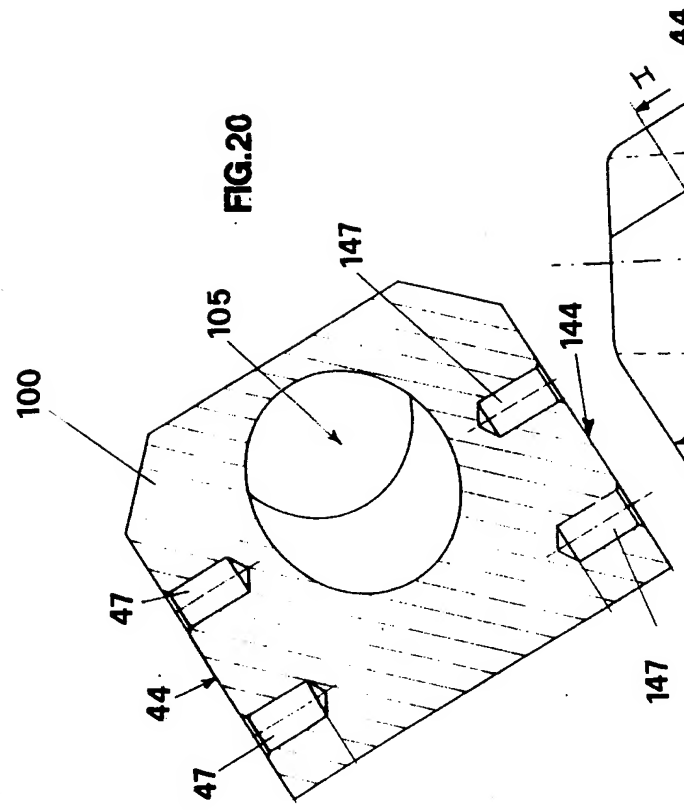

FIG.20

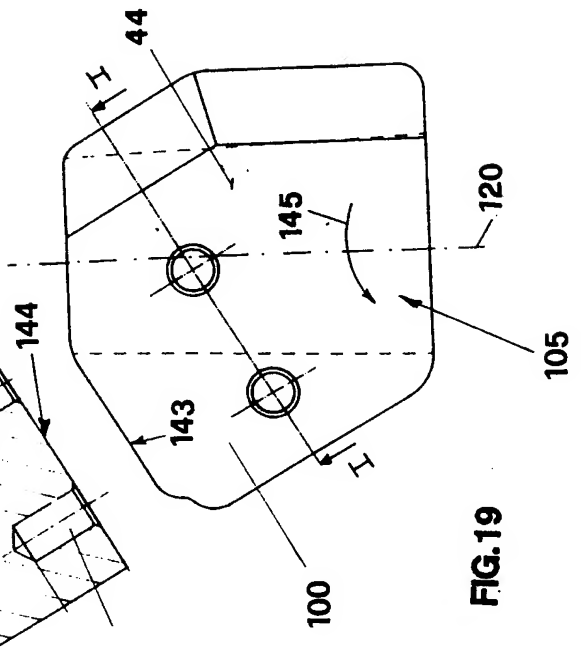

FIG.19

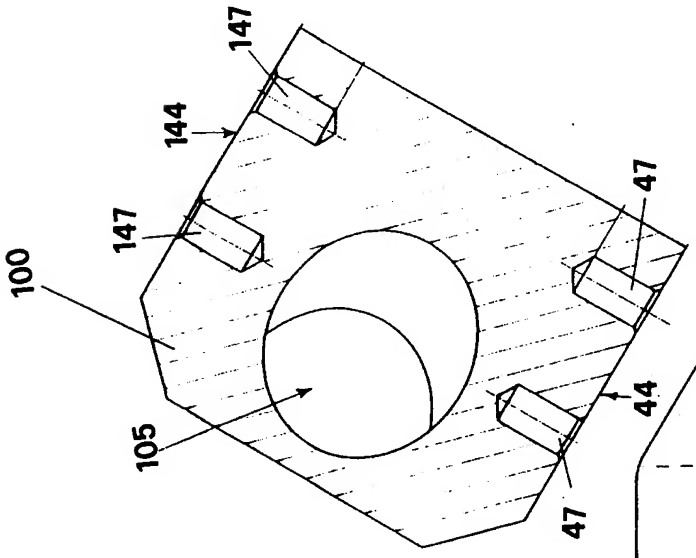

FIG.22

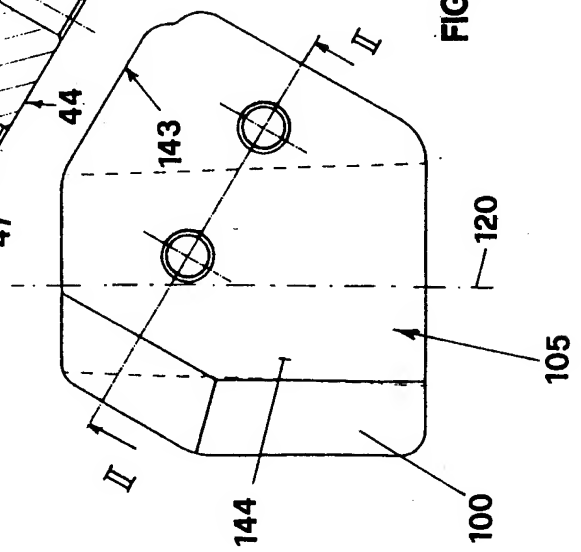

FIG.21

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 11 7400

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	DE 29 19 774 A (DRESSER IND) 15 November 1979 * page 7, paragraph 2 - page 9, paragraph 3; figures 1-4 *	1,2, 10-12, 15,18	E01C23/088
A	US 4 195 946 A (SWISHER GEORGE W JR) 1 April 1980 * column 9, line 9 - line 36; figures 5-7,16 *	1,10,11, 15	
A	US 4 262 966 A (BOUPLON EDWARD J) 21 April 1981 * column 3, line 39 - column 4, line 2; figures 15-19 *	1,10,11, 15	
A	DE 37 12 135 A (TAISEI ROAD CONSTRUCTION) 22 October 1987 * column 6, line 36 - column 7, line 19; figures 5-9 *	1,12,15, 18	
A	GB 2 118 227 A (KENNAMETAL INC) 26 October 1983 * the whole document *	1,12,16, 18	TECHNICAL FIELDS SEARCHED (Int.Cl.6) E01C E02F
A	EP 0 096 585 A (KOEHRING CO) 21 December 1983 * page 17, line 26 - page 18; figures 7-9 *	1,12	
A	EP 0 025 421 A (SANDVIK AB) 18 March 1981 * page 3 - page 4, paragraph 2; figures 1-5 *	1	
A	US 5 078 540 A (JAKOB HERBERT E ET AL) 7 January 1992		

-/--

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	14 February 1997	Paetzel, H-J

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X : particularly relevant if taken alone
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A : technological background
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D : document cited in the application
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EUROPEAN SEARCH REPORT

Application Number
EP 96 11 7400

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	EP 0 259 620 A (KENNAMETAL INC) 16 March 1988 -----		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	14 February 1997	Paetzel, H-J

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